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Short Report

Impact of tobacco outlet density and proximity on smoking cessation: A longitudinal observational study in two English cities

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ABSTRACT

A previous study conducted in the USA reported an association between residential proximity to a tobacco outlet and reduced likelihood of a quit attempt enduring beyond six months. We replicated this study in an English urban setting using data on 611 smokers motivated to quit, of whom 66 were biochemically validated as being quit at six months. Sustained quitting at six months was unrelated to residential proximity of a tobacco outlet. Future studies would be improved by the use of validated mappings of retail outlets, mapped in relation to multiple activity spaces, not just residence.

1. Background

Smoking is the main cause of preventable premature death, accounting for an estimated 6 million deaths worldwide each year (Tobacco Fact Sheet). It is also the single largest contributor to health inequalities in high income countries, explaining an estimated 20 to 50% of the variation in difference in life expectancy between the least and the most deprived groups (Marmot and Wilkinson, 2006). Rates of smoking have declined markedly over the past 40 years in most high-income countries but this decline has been less marked in those who are most socially and materially deprived. There is increasing interest in the contribution of neighbourhood characteristics to smoking rates, a focus with the potential for intervention. A similar focus is evident for alcohol control policies in which reduction of retail outlet densities have reduced alcohol-related harms (Campbell et al., 2009; Reynolds et al., 1997). By contrast, interventions to change neighbourhood environments to reduce smoking remain rare (Shareck and Frohlich, 2013). Our focus in this paper is upon one aspect of environments that hinders quitting and sustains smoking, namely the presence of tobacco retail outlets.

Young people living in neighbourhoods with a high density of tobacco retailers are more likely to have smoked in the previous month than those living in areas with lower density outlets, leading to suggestions that initiation of smoking in children and young adults may be reduced by limiting retail tobacco outlet density (Novak et al., 2006; Ogneva-Himmelberger et al., 2010; Lipperman-Kreda et al., 2012). Reducing the number of tobacco retail outlets may also increase the success of quit attempts. The majority of smokers in the UK and the USA want to stop, but while many attempt to quit each year, fewer than 7% will succeed even with pharmacotherapy (Moore et al., 2009). In a study conducted in the USA, quitters residing less than 250 m from the closest tobacco outlet were less likely than those living further away to sustain their quit attempt beyond six months (Reitzel et al., 2011). The aim of the current study is to replicate this study in an English urban setting using a well characterised data set of a cohort of smokers attempting to quit.

2. Methods

We used data from a cohort of 633 smokers who participated in a randomised controlled trial (RCT) in primary care assessing the impact of tailoring nicotine replacement therapy (NRT) by

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genotype (Trial registration ISRCTN14352545) (Marteau et al., 2010; 2012) (Appendix 1). Participants who wanted to quit smoking were recruited from 29 general practices in two English cities, Birmingham and Bristol.

2.1. Geocoding (digital coding of location using geographical information system software)

Residential postcodes were linked to the Easting and Northing coordinates from the "National Administrative Codes Service—Technology Reference Data Update Distribution (NACS-TRUD)" postcode lookup table (TRUD Service). We used ArcEditor software version 10.0 (ESRI, Redlands CA) to geocode them. We retrieved and analysed data on tobacco outlets using UK Ordnance Survey InterestMap dataset of 2009. Since there is no licence required to sell tobacco in England, newsagents, tobacconists, convenience stores, supermarkets, off-licences, shopping centres, nightclubs, pubs, bars and inns were assumed to be tobacco outlets.

To measure the proximity of each participant's home to the closest tobacco outlet, we used the Closest Facility tool in ArcGIS Network Analyst, which calculates the shortest travel distance in metres along the road network from the home to the closest outlet. We classified the proximity into: under 250 m, and from 250 m to under 500 m.

To measure density of tobacco retail outlets, we mapped four road network buffers around the residence of each participant using the New Service Area tool in the ArcGIS Network Analyst. This was based on travel distances of 250, 500, 1000 and 3000 m. Next, the geocoded tobacco outlets were overlaid with the road network buffers, and the numbers of outlets within each were identified using the Spatial Join tool. Outlet density for each buffer was then calculated by dividing the number of outlets by the area of each buffer.

3. Analysis

Following the analysis used by Reitzel et al., we modelled continuous abstinence by continuation ratio (CR) logit models using the STATA module OCRATIO and examined the influence of tobacco outlets on abstinence six months after quitting. Abstinence was used in the model as an ordered outcome. We had three levels of abstinence: 0 "not abstinent at 4 weeks", 1 "abstinent at 4 weeks but not at 6 months" and 2 "abstinent at 4 weeks and at 6 months". First, we ran respective CR logit models to assess the associations between tobacco outlet density within (1) 250 m, (2) 500 m, (3) 1 km and (4) 3 km of the participant's residence, and continuous abstinence at six months. Second, we ran respective CR logit models to assess the associations between tobacco outlet proximity within: (1) 250 m, and (2) 500 m of the participant's residence, and continuous abstinence at six months. To minimize confounding variables we progressively adjusted analyses for trial arm, city of residence, age, gender, education, ethnicity, and nicotine dependence (Appendix 2).

4. Results

We included 611 participants (417 from Birmingham and 194 individuals from Bristol) from the original RCT cohort, 22 being excluded because of missing data. At six months, 66 were recorded as quit, following biochemical validation. Participant characteristics are shown in Table 1. A summary of the density and distance to tobacco outlets in the two cities is presented in Table 2. The density of tobacco outlets and participants in each city are shown in Appendix 3.

Table 1
Participant demographic and smoking characteristics (N=611).

Characteristics	
Age (years), mean (95% CI[a], SE[b])	45.5 (41.95 to 48.99, 1.79)
Race/ethnicity, % (n)	
White	91 % (558)
Non-white	9 % (53)
Gender, % male (n)	46 %(282)
Education, % (n)	
No qualifications	28 %(173)
GCSE or GCE A-level	38 %(233)
Higher education	28 %(174)
Other	5 %(31)
Own or have use of a car % (n)	74 %(450)
abstinent at 4 weeks % (n)	47 %(287)
abstinent at 6 months (biochem validated) % (n)	11 %(66)
Pre-quit smoking rate[c]: median (IQR[d])	20 (16–26)
FTND[e] score: median (IQR), mean (95% CI, SE)	6 (4–7), 5.56 (5.39 to 5.73, 0.09)

[a] CI: Confidence interval.
[b] SE: Standard error.
[c] Pre-quit smoking rate is expressed in number of cigarettes per day.
[d] IQR: Interquartile range.
[e] FTND: Fagerström Test for Nicotine Dependence.

4.1. Tobacco outlet proximity

Smoking abstinence at six months was not predicted by the proximity of residences to the closest tobacco outlet in any analyses, adjusted for trial arm, city of residence, age, gender, education and ethnicity, or additional adjustment with pre-quit smoking rate or nicotine dependence score (Table 3).

4.2. Tobacco outlet density

Smoking abstinence at six months was not predicted by the density of tobacco outlets around participants' residences in any analyses, adjusted for trial arm, city of residence, age, gender, education and ethnicity (Table 3). Progressive adjustment for pre-quit smoking rate or nicotine dependence did not affect this result.

4.3. Sensitivity analysis

Sensitivity analyses were conducted using questionnaire-based abstinence records at weeks 1, 2, and 3, and biochemically validated abstinence at weeks 4 and at 6 months. Neither the proximity of residence to a tobacco outlet nor the density of tobacco outlets predicted abstinence in these analyses.

5. Discussion

Although there is some evidence that initiation of smoking is associated with ease of access to retail tobacco outlets (Novak et al., 2006; Ogneva-Himmelberger et al., 2010; Lipperman-Kreda et al., 2012), little is known about the relationship between ease of access and quitting. One study reported that distance from home to the nearest tobacco outlet but not the density of the outlets reduced the chances of a quit attempt extending beyond six months (Reitzel et al., 2011). Our analyses in two English cities failed to replicate this finding. There are several possible explanations for this including differences between the two studies in participants, places of residence and measures.

Regarding participants, there is a remarkable similarity in the ages, gender and pre-quit smoking rates between those in the

Table 2
Summary of density of tobacco outlets and distance to the nearest outlet by city of residence.

	Birmingham ($n=417$)		Bristol ($n=194$)	
	Median (IQR)	Min/Max	Median (IQR)	Min/Max
Variable				
Distance from residence to nearest tobacco outlet (in metres)	379 (220–545)	0/2528	350 (208–559)	7/1722
Number of tobacco outlets within a radius of:				
250 metres	0 (0–1)	0/10	0 (0–1)	0/6
500 metres	1 (0–3)	0/35	1 (0–4)	0/21
1 kilometre	7 (3–16)	0/145	7 (3–10)	0/78
1.5 kilometres	18 (10–34)	1/222	12 (8–23)	0/194
3 kilometres	83 (54–125)	9/388	33 (23–101)	8/385
Density[a] of tobacco outlets within a radius of:				
250 metres	0 (0–13)	0/123	0 (0–14)	0/97
500 metres	5 (0–12)	0/108	6 (0–16)	0/52
1 kilometre	6 (4–10)	0/85	6 (3–9)	0/48
1.5 kilometres	6 (4–10)	1/54	5 (3–8)	0/49
3 kilometres	6 (4–8)	1/22	3 (3–7)	1/29

[a] Density was calculated as the number of tobacco outlets divided by the area under consideration.

study of Reitzel et al. (2011) and our own, but the two studies differed in ethnic composition with participants in the current study being predominantly white (91% compared with only 33% in Reitzel's *ibid.*). The sample size in the current study was larger than that in Reitzel's by about 30% ($n=611$ vs. 414) and the quit rate was higher (11% versus 4% at six months, the latter figure being provided to us in a personal communication from Reitzel), so reduced power would not explain the difference in findings between the studies. Participants in the current study were recruited via general practices in which all smokers were written to and those motivated to both stop smoking and take part in the RCT were recruited (about 5% of those written to). By contrast, Reitzel et al. recruited smokers through print and radio advertisements. If the latter method yielded smokers with lower motivation to quit smoking this might have made them more sensitive to tobacco retail outlets.

Regarding place, the residential density in housing differed between the English cities in the current study and that of Houston, the place studied in Reitzel et al. with the latter being almost three times less densely populated than the English cities (see Appendix 2). Given residential density is associated with walking (Rodriguez et al., 2009) we might expect that proximity and density of retail outlets would have a more potent impact on purchasing and consumption. This difference between the studies seems an unlikely explanation for a difference in findings between the two studies.

Regarding measures, both studies used biochemically-validated measures of quitting. The studies differed, however, in their measures of the other critical variable, namely the coding of tobacco retail outlets. Given the requirement for licensing at state level in the USA, Reitzel et al. obtained tobacco outlet addresses from the Texas Comptroller of Public Accounts, who keeps a record of all facilities licensed to sell tobacco in Houston and surrounding area. England operates what can be called a negative licensing system: anyone can sell tobacco but if they contravene various regulations regarding its sale, including sales to those less than18 years of age, they lose the right to sell it. There are therefore no records of tobacco retailers, only of retailers not allowed to sell it. The resultant inaccuracies in mapping retail outlets using just information on type of store may therefore be one explanation for this failed replication.

The current study had a number of strengths. To our knowledge it is the first UK study to examine the association between continuous abstinence after quitting and access to tobacco outlets. It is also the first attempted replication of a novel report of an association between proximity to a tobacco outlet and successful quitting. As such, the current study contributes to a small but growing evidence base of the effects of area characteristics on smoking behaviour, with the potential to suggest new tobacco control interventions (Shareck and Frohlich, 2013).

Alongside these strengths the current study had some limitations. The first limitation concerns the use of tobacco outlet data from a single point in time, three years after the smoking status of participants was ascertained. We note, however, that a similar mismatch in time was evident in Reitzel et al. The second limitation regarding the accuracy of the tobacco outlet mapping is discussed above. A third limitation of the current study is its focus on residence, to the exclusion of the other environments in which people spend time, including for work, study and leisure, a focus that has been termed the "residential trap" in area and health research (Chaix, 2009). Studying the influence upon smoking of areas measured as systems, composed of many and interconnected environments, or, "activity spaces" warrants further study (Shareck and Frohlich, 2013). Future studies might also include a whole map approach (in contrast to the case study approach of the current study) to explore spatial heterogeneity i.e. whether processes are working similarly in different places.

6. Conclusions

Tobacco use remains the main cause of preventable premature death worldwide. Novel approaches to its control seem likely from study of where it is sold. While we did not replicate a previous observation in a US urban setting that tobacco outlet proximity is associated with quitting success, future studies are warranted, with methodological improvements on the two studies conducted to date.

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Table 3
Associations between tobacco outlet proximity and density, and continuous abstinence up to six months.

Distance to outlet or density of outlets	Number of[a] individuals*	Beta[b] (SE)	Odds ratio [c](95% CI [d])	χ^2[e]	*P*-value [f]
Model 1[g]					
Distance < 250 m[h]	611	−0.06 (0.17)	0.94 (0.67; 1.32)	0.11	0.738
Distance < 500 m	611	−0.09 (0.17)	0.91 (0.65; 1.28)	0.28	0.598
Density within 250 m	611	0.00 (0)	1.00 (0.99; 1.01)	0.19	0.660
Density within 500 m	611	0.00 (0.01)	1.00 (0.99; 1.01)	0.02	0.900
Density within 1 km[i]	611	0.00 (0.01)	1.00 (0.99; 1.02)	0.30	0.585
Density within 3 km	611	0.00 (0.02)	1.00 (0.97; 1.03)	0.00	0.972
Model 2[j]					
Distance < 250 m	610	−0.05 (0.17)	0.95 (0.68; 1.34)	0.08	0.784
Distance < 500 m	610	−0.10 (0.17)	0.91 (0.65; 1.28)	0.31	0.580
Density within 250 m	610	0.00 (0)	1.00 (0.99; 1.01)	0.24	0.623
Density within 500 m	610	0.00 (0.01)	1.00 (0.99; 1.01)	0.00	0.990
Density within 1 km	610	0.00 (0.01)	1.00 (0.99; 1.02)	0.27	0.603
Density within 3 km	610	0.00 (0.02)	1.00 (0.97; 1.03)	0.00	0.969
Model 3[k]					
Distance < 250 m	611	−0.01 (0.17)	0.99 (0.7; 1.39)	0.01	0.937
Distance < 500 m	611	−0.06 (0.17)	0.95 (0.67; 1.33)	0.10	0.751
Density within 250 m	611	0.00 (0)	1.00 (0.99; 1.01)	0.02	0.902
Density within 500 m	611	0.00 (0.01)	1.00 (0.99; 1.01)	0.26	0.613
Density within 1 km	611	0.00 (0.01)	1.00 (0.99; 1.02)	0.28	0.595
Density within 3 km	611	0.00 (0.02)	1.00 (0.97; 1.03)	0.00	0.966

[a] The number of individuals represents the number of individuals with information on all the covariates included in the model. For example, individuals living within 250 m of a tobacco outlet did not have a significantly different likelihood of remaining abstinent than individuals living further away from a tobacco outlet, and this result was not affected by adjustment.
[b] Beta: natural logarithm of the odds ratio.
[c] Odds ratios represent the likelihood of remaining abstinent depending on either distance from home to nearest tobacco outlet or density of outlets in the immediate neighbourhood. In Model 1 the odds ratio was 0.94 (0.67; 1.32); in Model 2 it was 0.95 (0.68; 1.34) and in Model 3 it was 0.99 (0.70; 1.39). There were 611 individuals with information on all covariates in Model 1 and [k]in Model 3, and 610 with information on FTND score as well.
[d] CI: confidence interval.
[e] χ^2: Chi-square test of significance.
[f] *P*-value: *P*-value of significance of the odds ratio.
[g] Model 1: Adjusted for trial arm, city of residence, age, gender, education and ethnicity.
[h] m: Metres.
[i] km: Kilometres.
[j] Model 2: Model 1 further adjusted for FTND score.
[k] Model 3: Model 1 further adjusted for pre-quit smoking rate (number of cigarettes per day).

Table A2
Comparison of analyses in the current study with those conducted by Reitzel et al. (2011).

	Reitzel et al. (2011)	**Current study**
Setting		
Population density	Houston 1505/km^2	Birmingham 3806/km^2, Bristol 3888/km^2
Adjustments in analyses		
Participant characteristics		
Age, gender	Yes	Yes
Education	< High school/GED[a], high school/GED, some college, college	No qualifications, GCSE/GCE[b], A-level, higher education, degree, other
Ethnicity	White, Black, Latino	White, non-white
Living with a partner	Yes	No (not collected)
Employment status	Yes	No (not collected)
Others	No	Trial arm (phenotype, genotype); city of residence (Birmingham, Bristol)
Tobacco-related variables[c]		
Pre-quit smoking rate	Yes	Yes (part of FTND[d])
Years smoked	Yes	No (not collected)
FTND score	No	Yes
Predictor variables		
Distance to nearest tobacco outlet	< 250 m, ≥ 250 m	< 250 m, ≥ 250 m
Density of tobacco outlets	500 m, 1 km and 3 km buffers	250 m, 500 m, 1 km and 3 km buffers
Distance to the nearest bus stop	No	< 250 m, ≥ 250 m
Outcomes		
Abstinence—Biochemical measurements at	1, 2, 4 and 26 weeks	28 days (4 weeks), 6 months (26 weeks)

[a] GED: General Educational Development; GCSE: General Certificate of Secondary Education.
[b] GCE: General Certificate of Education; FTND: Fagerström Test for Nicotine Dependence.
[c] Included as rates of smoking cessation differed between trial arms.
[d] In contrast with Reitzel et al. 2011, we did not have data for past number of years of smoking, so we analysed separate models using either Fagerström Test for Nicotine Dependence (FTND) (Heatherton et al., 1991) or pre-quit smoking rate.

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MA used her own time contributing to the work.

Authors' contributions

TMM had the idea for the study; TH acted as co-ordinator; MA, AN and TH conducted the analyses; TH, MA, AN, and GJH wrote the draft of the manuscript and TMM revised it. All authors edited and approved the final version. TMM is the guarantor.

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Appendix A1. Details of the RCT intervention (Marteau et al., 2010)

Nicotine replacement therapy (NRT) was offered to all participants. All participants, regardless of group allocation, were prescribed a nicotine patch dose based on daily cigarette consumption. In addition participants were prescribed an oral 'top-up' NRT. The doses of oral NRT were based either on their mu-opioid receptor (OPRM1) genotype, which was known to be associated with smoking cessation (Ray et al., 2006; Lerman et al., 2004), or their Fagerstrom Test for Nicotine Dependence score (phenotype). In the genotypic arm, those who were homozygous for the Asn40 variant were prescribed a dose of 6 mg per day; and for those who were heterozygous or homozygous for the Asp40 variant of the gene, a doubled dose was prescribed (12 mg). The prescribed dose of oral NRT in phenotypic arm was determined using the Fagerstrom Test for Nicotine Dependence (FTND) score (Heatherton et al., 1991). Those scoring below eight were given a dose of oral NRT of 6 mg per day, while those scoring eight or more were prescribed a doubled dose (12 mg). Abstinence was recorded weekly and verified by exhaled carbon monoxide (CO) at 28 days and 6 months. At 28 days abstinence was defined as having smoked fewer than five cigarettes in the past two weeks verified by CO of less than or equal to 10 ppm. At six months, abstinence was defined as prolonged abstinence since the start of week three of the quit attempt, with fewer than five cigarettes smoked and verified by cotinine, less than or equal to15 ng/ml. The smoking advisor assessed the NRT used from a diary record and a count of remaining NRT. All smoking advisors were trained to give behavioural support to NHS standards (NCSCT (NHS Centre for Smoking Cessation and Training), 2010). The support lasted 10–30 min, depending upon progress and stage of the quit attempt, and was identical in both arms. Support for behaviour change was based on withdrawal orientated therapy (Hajek, 1989) and was provided for all participants twice prior to quit day and weekly thereafter until four weeks after quitting and then once more eight weeks after quitting. Adherence to NRT, the primary endpoint for the RCT, was similar between the two treatment arms.135 participants were lost to follow-up at 6 months with rates of loss similar in both arms.

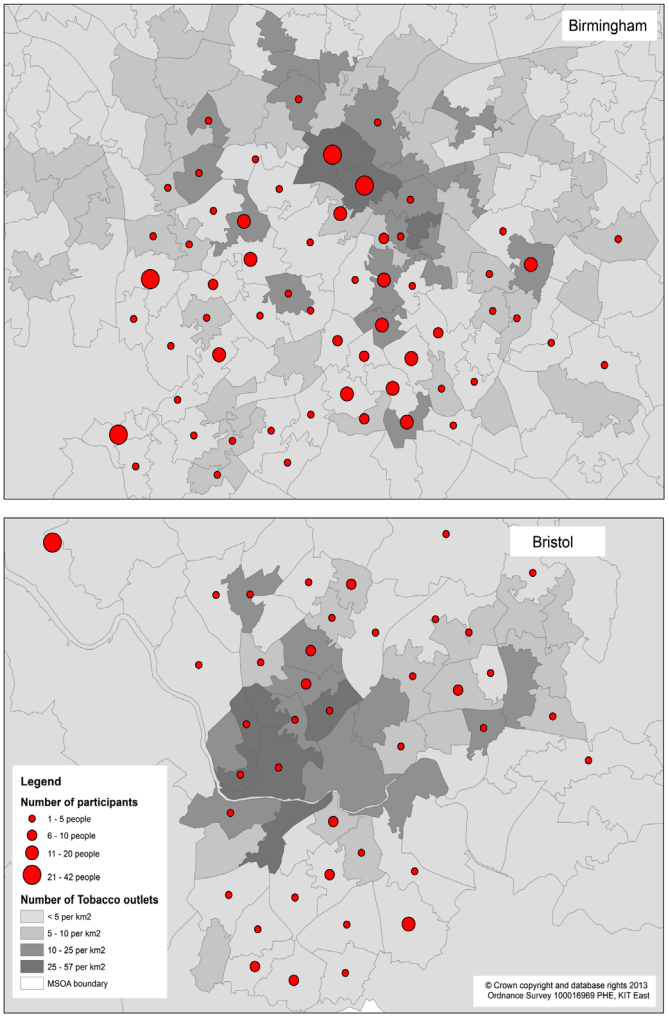

Fig. A3. Density of tobacco outlets and participants by middle layer super output area (MSOA) in Bristol and Birmingham .

Appendix A2

See Table A2.

Appendix A3

See Fig. A3.

References

Campbell, C.A., Hahn, R.A., Elder, R., Brewer, R., Chattopadhyay, S., Fielding, J., Naimi, T.S., Toomey, T., Lawrence, B., Middleton, J.C., 2009. The effectiveness of limiting alcohol outlet density as a means of reducing excessive alcohol consumption and alcohol-related harms. Am. J. Prev. Med. 37 (6), 556–569.

Chaix, B., 2009. Geographic life environments and coronary heart disease: a literature review, theoretical contributions, methodological updates, and a research agenda. Annu. Rev. Public Health 30, 81–105.

Hajek, P., 1989. Withdrawal-oriented therapy for smokers. Br. J. Addict. 84, 591–598.

Heatherton, T.F., Kozlowski, L.T., Frecker, R.C., Fagerstrom, K.-O., 1991. The Fagerstrom test for nicotine dependence: a revision of the Fagerstrom tolerance questionnaire. Br. J. Addict. 86 (9), 1119–1127.

Lerman, C., Wileyto, E.P., Patterson, F., Rukstalis, M., Audrain-McGovern, J., Restine, S., Shields, P.G., Kaufmann, V., Redden, D., Benowitz, N., et al., 2004. The

functional mu opioid receptor (OPRM1) Asn40Asp variant predicts short-term response to nicotine replacement therapy in a clinical trial. Pharmacogenomics J 4 (3), 184–192.
Lipperman-Kreda, S., Grube, J.W., Friend, K.B., 2012. Local tobacco policy and tobacco outlet density: associations with youth smoking. J. Adolesc. Health 50 (6), 547–552.
Marmot, M.G., Wilkinson, R.G., 2006. Social Determinants of Health, second ed. Oxford: Oxford University Press.
Marteau, T.M., Munafo, M.R., Aveyard, P., Hill, C., Whitwell, S., Willis, T.A., Crockett, R.A., Hollands, G.J., Johnstone, E.C., Wright, A.J., et al., 2010. Trial protocol: using genotype to tailor prescribing of nicotine replacement therapy: a randomised controlled trial assessing impact of communication upon adherence. BMC Public Health 10, 680.
Marteau, T.M., Aveyard, P., Munafò, M.R., Prevost, A.T., Hollands, G.J., Armstrong, D, Sutton, S., Hill, C., Johnstone, E., Kinmonth, A.L., 2012. Effect on adherence to nicotine replacement therapy of informing smokers their dose is determined by their genotype: a randomised controlled trial. PLoS One 7 (4), e35249.
Moore, D., Aveyard, P., Connock, M., Wang, D., Fry-Smith, A., Barton, P., 2009. Effectiveness and safety of nicotine replacement therapy assisted reduction to stop smoking: systematic review and meta-analysis. BMJ 338, b1024.
NCSCT (NHS Centre for Smoking Cessation and Training), 2010. Learning Outcomes for Training Stop Smoking Specialists. NCSCT, London (In:).
Novak, S.P., Reardon, S.F., Raudenbush, S.W., Buka, S.L., 2006. Retail tobacco outlet density and youth cigarette smoking: a propensity-modeling approach. Am. J. Public Health 96 (4), 670–676.
Ogneva-Himmelberger, Y., Ross, L., Burdick, W., Simpson, S.A., 2010. Using geographic information systems to compare the density of stores selling tobacco and alcohol: youth making an argument for increased regulation of the tobacco permitting process in Worcester, Massachusetts, USA. Tob Control 19 (6), 475–480.
Ray, R., Jepson, C., Patterson, F., Strasser, A., Rukstalis, M., Perkins, K., Lynch, K.G., O'Malley, S., Berrettini, W.H., Lerman, C., 2006. Association of OPRM1 A118G variant with the relative reinforcing value of nicotine. Psychopharmacology (Berl) 188 (3), 355–363.
Reitzel, L.R., Cromley, E.K., Li, Y., Cao, Y., Dela Mater, R., Mazas, C.A., Cofta-Woerpel, L., Cinciripini, P.M., Wetter, D.W., 2011. The effect of tobacco outlet density and proximity on smoking cessation. Am. J. Public Health 101 (2), 315–320.
Reynolds, R.I., Holder, H.D., Gruenewald, P.J., 1997. Community prevention and alcohol retail access. Addiction 92 (Suppl. 2), S261–S272.
Rodriguez, D.A., Evenson, K.R., Diez Roux, A.V., Brines, S.J., 2009. Land use, residential density, and walking. The multi-ethnic study of atherosclerosis. Am. J. Prev. Med. 37 (5), 397–404.
Shareck, M., Frohlich, K., 2013. Rethinking exposure in area studies on social inequities in smoking in youth and young adults. In: Stock, C., Ellaway, A. (Eds.), Neighbourhood Structure and Health Promotion. ed.. Springer US, pp. 267–286.
TRUD Service [⟨https://www.uktcregistration.nss.cfh.nhs.uk/trud/⟩].
Tobacco Fact Sheet **No. 339** [⟨http://www.who.int/mediacentre/factsheets/fs339/en/⟩].